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THE EXTENDED ISOGEOMETRIC BOUNDARY ELEMENT METHOD (XIBEM): AN ENRICHED COLLOCATION BEM FOR WAVE SCATTERING ANALYSIS

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Isogeometric analysis [1] is an increasingly popular research topic. By using the functions that describe geometries in computer-aided design (CAD) directly in numerical analysis, it offers the possibility of running engineering simulations without the need for meshing.

As the functions in CAD only describe the bounding surface of geometries, the boundary element method (BEM) is the ideal tool for isogeometric analysis. This combination provides solutions of higher accuracy than the conventional BEM due the exact geometry being utilised [2].

In this work, we make use of an isogeometric BEM to find solutions to frequency-domain wave problems governed by the Helmholtz equation. We extend this method by using the partition-of-unity approach [3], in which the approximating functions are multiplied by families of plane waves. We call this plane-wave enriched approach the eXtended Isogeometric Boundary Element Method (XIBEM). When compared to conventional BEM and isogeometric BEM schemes, it requires significantly fewer equations to provide a prescribed accuracy of solution for a given frequency and geometry of problem.

An overview of the method will be presented with supporting numerical results.

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